AMENDMENTS TO THE CLAIMS

The claims in this listing will replace all prior versions, and listings, of claims in the application.

1. (Original) A retracting mechanism for a retractable lens including an optical system having a plurality of optical elements, said optical element retracting mechanism comprising:

a linearly movable ring configured to be guided along an optical axis of said optical system without rotating, said ring further configured to retract toward a plane along said optical axis when said retractable lens moves from an operational state to a fully-retracted state;

a swingable holder pivoted on a pivot and swingable about said pivot, said swingable holder positioned inside and supported by said linearly movable ring, said swingable holder supporting a retractable optical element as one of said plurality of optical elements;

a position-controller holding said swingable holder such that said retractable optical element remains on said optical axis when said retractable lens is in said ready-to-photograph state, said position-controller configured to rotate said swingable holder about said pivot such that said retractable optical element retracts to a position which deviates from said optical axis when said linearly movable ring, together with said swingable holder, retracts toward said plane;

a pair of support plates attached to opposite ends of said linearly movable ring in said optical axis direction, and support opposite ends of said pivot, respectively;

a support plate fixing device fixing said pair of support plates to said linearly

movable ring, wherein said support plate fixing device is configured to allow said pair of support plates to move relative to said linearly movable ring in directions lying in a plane orthogonal to said optical axis when said support plate fixing device is in a released state;

at least one rotatable shaft having a shaft axis substantially parallel to said optical axis, supported by said linearly movable ring to be rotatable about said shaft axis, said rotatable shaft having a pair of eccentric pins at opposite ends thereof, said pair of eccentric pins having a common axis eccentric to said shaft axis of said rotatable shaft; and

at least one pair of elongated holes respectively on said pair of support plates, facing each other and elongated substantially parallel to each other, said pair of eccentric pins being engaged in said pair of elongated holes and configured to be movable therein;

wherein said pair of support plates are configured to be moved relative to said linearly movable ring in said directions lying in said plane orthogonal to said optical axis via a rotation of said rotatable shaft, without substantially changing a relative position between said pair of support plates, when said support plate fixing device is in said released state.

2. (Original) The optical element retracting mechanism according to claim 1, wherein said linearly movable ring comprises a pair of substantially parallel flat surfaces which are separate from each other in said optical axis direction, which extend in a direction substantially orthogonal to said optical axis, and which do not overlap said retractable optical element in said optical axis direction, said pair of support plates pressed against a respective said pair of parallel flat surfaces and fixed thereto by said support plate fixing device.

3. (Original) The optical element retracting mechanism according to claim 1, further comprising an internal optical element positioned inside said linearly movable ring on one of opposite sides of said retractable optical element in said optical axis direction, wherein said pair of support plates are attached to said opposite ends of said linearly movable ring and positioned on opposite sides of said internal optical element in said optical axis direction, respectively.

4. (Original) The optical element retracting mechanism according to claim 3, wherein said internal optical element comprises at least one of a shutter and a diaphragm.

5. (Original) The optical element retracting mechanism according to claim 1, wherein said support plate fixing device comprises:

a screw hole located on one of said pair of support plates and penetrating therethrough in said optical axis direction;

a screw insertion hole located on the other of said pair of support plates and penetrating therethrough in said optical axis direction; and

a set screw inserted into said screw insertion hole and screwed through said screw hole.

6. (Original) The optical element retracting mechanism according to claim 1, wherein said rotatable shaft comprises a first rotatable shaft and a second rotatable shaft;

wherein said pair of elongated holes comprises a first pair of elongated holes and a second pair of elongated holes;

wherein said pair of eccentric pins of said first rotatable shaft are engaged in said first pair of elongated holes, respectively;

wherein said pair of eccentric pins of said second rotatable shaft are engaged in

said second pair of elongated holes, respectively; and

wherein a direction of elongation of said first pair of elongated holes and a direction of elongation of said second pair of elongated holes are generally orthogonal to each other on said pair of support plates, respectively.

7. (Original) The optical element retracting mechanism according to claim 1, wherein said swingable holder further comprises:

a cylindrical lens holder portion holding said retractable optical element;

a pivoted cylindrical portion fitted on said pivot to be rotatable thereon; and

a swing arm portion extending between said cylindrical lens holder and said pivoted cylindrical portion and connecting said cylindrical lens holder to said pivoted cylindrical portion.

8. (Original) The optical element retracting mechanism according to claim 1, wherein said position-control device comprises:

a spring configured to bias said swingable holder to rotate in a direction to position said retractable optical element on said optical axis; and

a cam configured to rotate said swingable holder to said deviated position from said optical axis, against the biasing force of said spring, when said linearly movable ring, together with said swingable holder, retracts toward said plane.

9. (Original) The optical element retracting mechanism according to claim 1, wherein said plurality of optical elements comprise at least one rear optical element positioned behind said retractable optical element when said retractable lens is in said operational state; and

wherein said retractable optical element is configured to be positioned in an

off-axis space radially outside an on-axis space in which said rear optical element is positioned, such that said retractable optical element and said rear optical element are in substantially a same positional range in the optical axis direction, when said retractable lens is in said fully-retracted state.

10. (Original) The optical element retracting mechanism according to claim 1, wherein said pivot extends substantially parallel to said optical axis.

11. (Original) The optical element retracting mechanism according to claim 1, wherein said retractable optical element comprises a lens group.

12. (Original) The optical element retracting mechanism according to claim 1, wherein said optical system comprises a zoom photographing optical system; and

wherein said retractable optical element comprises a lens group as a part of said zoom photographing optical system.

13. (Original) The optical element retracting mechanism according to claim 1, wherein said optical element retracting mechanism is incorporated in a digital camera.

14. (Original) The optical element retracting mechanism according to claim 1, wherein at least one elongated hole of said pair of elongated holes that are respectively located on said pair of support plates comprises a through hole which penetrates through a corresponding one of said pair of support plates in said optical axis direction, and wherein one of said pair of eccentric pins which is engaged in said through hole includes an operating portion via which said one of said pair of eccentric pins can be rotated.

15. (Original) The optical element retracting mechanism according to claim 14, wherein said operating portion of said rotatable shaft is provided on an end of a front eccentric pin of said pair of eccentric pins,

wherein said optical element retracting mechanism further comprises:

an outer barrel surrounding said linearly movable ring, and provided with a radially inward flange positioned in front of said linearly movable ring,

wherein said radially inward flange has at least one through hole which penetrates through said radially inward flange in said optical axis direction, said operating portion accessible from the front of said linearly movable ring via said through hole.

16. (Original) The optical element retracting mechanism according to claim 14, wherein said support plate fixing device comprises:

a screw hole located on one of said pair of support plates and penetrating therethrough in said optical axis direction;

a screw insertion hole located on the other of said pair of support plates and penetrating therethrough in said optical axis direction; and

a set screw inserted into said screw insertion hole and screwed through said screw hole,

wherein one of opposite ends of said set screw, which is directed toward a side toward which said operating portion is directed, comprises an operating portion via which said set screw can be rotated.

17. (Original) The optical element retracting mechanism according to claim 16, wherein said operating portion of said set screw faces toward a frontward direction in the optical axis direction,

wherein said optical element retracting mechanism further comprises:

an outer barrel surrounding said linearly movable ring, and provided with a radially inward flange positioned in front of said linearly movable ring,

wherein said radially inward flange includes at least one through hole which penetrates through said radially inward flange in said optical axis direction, said operating portion of said set screw accessible from the front of said linearly movable ring via said through hole.

18. (Original) The optical element retracting mechanism according to claim 15, wherein said retractable lens comprises a lens barrier mechanism detachably attached to a front part of said radially inward flange to cover said through hole.

19. (Original) The optical element retracting mechanism according to claim 17, wherein said retractable lens comprises a lens barrier mechanism detachably attached to a front part of said radially inward flange to cover said through hole.

20. (Original) The optical element retracting mechanism according to claim 15, wherein said outer barrel supports one of said plurality of optical elements which is positioned in front of said retractable optical element, said outer barrel retracting toward said plane together with said linearly movable ring along said optical axis when said retractable lens moves from said operational state to said fully-retracted state.

21. (Original) The optical element retracting mechanism according to claim 17, wherein said outer barrel supports one of said plurality of optical elements positioned in front of said retractable optical element, said outer barrel retracting toward said plane together with said linearly movable ring along said optical axis when said retractable lens moves from said operational state to said fully-retracted state.

22. (Original) The optical element retracting mechanism according to claim 14, wherein said operating portion comprises a slot in which an adjusting tool can be engaged.

23. (Original) The optical element retracting mechanism according to claim 16, wherein said operating portion of said set screw comprises a slot in which an adjusting tool can be engaged.

24. (New) A digital camera having a body and a lens barrel, the lens barrel housed within the body, the lens barrel comprising a retractable lens including an optical system having a plurality of optical elements, the lens barrel further comprising a retracting mechanism, the retracting mechanism comprising:

a linearly movable ring configured to be guided along an optical axis of said optical system, said ring further configured to retract toward a plane along said optical axis when said retractable lens moves from an operational state to a retracted state;

a swingable holder pivoted on a pivot and swingable about said pivot, said swingable holder positioned inside and supported by said linearly movable ring, said swingable holder supporting a retractable optical element as one of said plurality of optical elements;

a position-controller configured to hold said swingable holder such that said retractable optical element remains on said optical axis when said retractable lens is in said ready-to-photograph state, said position-controller further configured to rotate said swingable holder about said pivot such that said retractable optical element retracts to a position which deviates from said optical axis when said linearly movable ring, together with said swingable holder, retracts toward said plane;

a pair of support plates attached to opposite ends of said linearly movable ring generally in said optical axis direction, and support opposite ends of said pivot, respectively;

a support plate fixing device configured to fix said pair of support plates to said linearly movable ring, wherein said support plate fixing device is further configured to allow said pair of support plates to move relative to said linearly movable ring in directions lying in a plane generally orthogonal to said optical axis when said support plate fixing device is in a released state;

at least one rotatable shaft having a shaft axis generally parallel to said optical axis, supported by said linearly movable ring to be rotatable about said shaft axis, said rotatable shaft having a pair of eccentric pins at opposite ends thereof, said pair of eccentric pins having a common axis eccentric to said shaft axis of said rotatable shaft; and

at least one pair of elongated holes respectively on said pair of support plates, facing each other and elongated substantially parallel to each other, said pair of eccentric pins being engaged in said pair of elongated holes and configured to be movable therein;

wherein said pair of support plates are configured to be moved relative to said linearly movable ring in said directions lying in said plane generally orthogonal to said optical axis via a rotation of said rotatable shaft, without substantially changing a relative position between said pair of support plates, when said support plate fixing device is in said released state.

25. (New) The camera according to claim 24, wherein said linearly movable ring comprises a pair of substantially parallel flat surfaces which are separate from each other in said optical axis direction, which extend in a direction substantially orthogonal to said optical axis, and which do not overlap said retractable optical element in said optical axis direction, said pair of support plates pressed against a respective said pair of parallel flat

surfaces and fixed thereto by said support plate fixing device.

26. (New) The camera according to claim 24, further comprising an internal optical element positioned inside said linearly movable ring on one of opposite sides of said retractable optical element in said optical axis direction, wherein said pair of support plates are attached to said opposite ends of said linearly movable ring and positioned on opposite sides of said internal optical element in said optical axis direction, respectively.

27. (New) The camera according to claim 24, wherein said support plate fixing device comprises:

a screw hole located on one of said pair of support plates and penetrating therethrough in said optical axis direction;

a screw insertion hole located on the other of said pair of support plates and penetrating therethrough in said optical axis direction; and

a set screw inserted into said screw insertion hole and screwed through said screw hole.

28. (New) The camera according to claim 24, wherein said rotatable shaft comprises a first rotatable shaft and a second rotatable shaft;

wherein said pair of elongated holes comprises a first pair of elongated holes and a second pair of elongated holes;

wherein said pair of eccentric pins of said first rotatable shaft are engaged in said first pair of elongated holes, respectively;

wherein said pair of eccentric pins of said second rotatable shaft are engaged in said second pair of elongated holes, respectively; and

wherein a direction of elongation of said first pair of elongated holes and a

direction of elongation of said second pair of elongated holes are generally orthogonal to each other on said pair of support plates, respectively.

29. (New) The camera according to claim 24, wherein said swingable holder further comprises:

a cylindrical lens holder portion holding said retractable optical element;

a pivoted cylindrical portion fitted on said pivot to be rotatable thereon; and

a swing arm portion extending between said cylindrical lens holder and said pivoted cylindrical portion and connecting said cylindrical lens holder to said pivoted cylindrical portion.

30. (New) The camera according to claim 24, wherein said position-control device comprises:

a spring configured to bias said swingable holder to rotate in a direction to position said retractable optical element on said optical axis; and

a cam configured to rotate said swingable holder to said deviated position from said optical axis, against the biasing force of said spring, when said linearly movable ring, together with said swingable holder, retracts toward said plane.

31. (New) The camera according to claim 24, wherein said plurality of optical elements comprise at least one rear optical element positioned behind said retractable optical element when said retractable lens is in said operational state; and

wherein said retractable optical element is configured to be positioned in an off-axis space radially outside an on-axis space in which said rear optical element is positioned, such that said retractable optical element and said rear optical element are in substantially a same positional range in the optical axis direction, when said retractable

lens is in said retracted state.

32. (New) The camera according to claim 24, wherein said pivot extends generally parallel to said optical axis.

33. (New) The camera according to claim 24, wherein said retractable optical element comprises a lens group.

34. (New) The camera according to claim 24, wherein said optical system comprises a zoom photographing optical system; and

wherein said retractable optical element comprises a lens group as a part of said zoom photographing optical system.